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PROTECTION OF THE WATERSHED OF THE NEWARK WATER WORKS[1]

By Morris R. Sherrerd

In providing for the protection of the gravity water supply of Newark, New Jersey, the board in charge went so far as to secure legislation authorizing the construction of sewerage systems in the watershed at the city's expense. The law permitted the board to enter on any property and connect the outhouses and other toilet facilities with such sewers, and this was opposed by some of the parties affected by it. In the small town of Newfoundland, where the population was more congested than elsewhere in the watershed, the board proposed to install not only a sewerage system at the expense of the city of Newark but also a water system, and to charge only $5 per year per house for water. The opposition in this case was so great that the board changed its policy and instead of installing sewer systems it decided to acquire property. In 1900 the city of Newark owned only about 7,000 acres, including the area occupied by the reservoirs, while today it owns about 43. of the 63 square miles embraced in the watershed.

The supply comes from 63 square miles of the watershed of the Pequannock River, a tributary of the Passaic River, about 30 miles from the city. There are two pipe lines, 42 and 48 inches in diameter, with a receiving reservoir at Cedar Grove about 10 miles from the city. The two pipe lines have a daily capacity of about 50,000,000 gallons. The effect of the construction of new works and the increase in the consumption of water on the cost of water per million gallons is shown by the following figures. In 1892 the city paid $4,000,000 on account of its water works and the cost of water at that time was about $50 per million gallons, but by 1900 the cost had run down to $26 as a result of increased use of water. In the latter part of that year $2,000,000 was invested in the water works and the cost of water was run up to $38. The payment for the Cedar Grove reservoir in 1905 increased this cost to $40, but growing consumption has gradually brought it down to $30 now. This is for water delivered into the city's reservoirs and includes sinking fund charges and the maintenance of the watershed and Cedar Grove reservoir. In 1922, when the bonds have been retired, the cost of water to the city from this source will be under $5, although the average cost of water for the city will be more because the existing supply must be supplemented by a supply from another source.

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[1] An informal address explaining a series of lantern slides shown at a meeting of the New York Section on December 20, 1916.

In addition to the expenses for the development of its water supply the city has outstanding $1,300,000 in bonds for the acquisition of properties, mainly for the purpose of preventing the pollution of the water. Most of this land is under forestration, and the accompanying illustration of one of our forest lookouts discloses one of the duties of our foresters. The city has built a number of them, each with a telephone connection, and in each is stationed a watchman paid by the United States government. If he detects a fire he telephones at once to the nearest fire warden. This year, which has been a rather wet one, we have put out 315 fires by means of this system, which is under the general charge of the State Forestry Department of New Jersey. In carrying on the forestry work the city has set out about a million trees, and now has a million more in its nurseries.

The acquisition of watershed property has had a marked effect on the population. In 1900 the population was probably between 35 and 40 per square mile. The acquisition of farms and the removal of three hotels brought this down to 16 per square mile of permanent residents and 5 per square mile of summer boarders. The acquisition of this property has not been without its troubles and its amusing side as well. A woman owning land which drained in part toward the Oak Ridge Reservoir and in part toward the Clinton Reservoir wished to have the property given a double valuation because those dwelling there "pollute both ways." The toilet compartments on the cars of the railroad traversing the watershed are kept locked while crossing it.

In tearing down the houses, a large amount of lumber was salvaged and used in building the houses in a model village just below Macopin Intake. Formerly the farms acquired to prevent pollution were turned over to the board's men as tenants, but this did not seem in accordance with sanitary precepts so it was decided to construct a village for them, with a school-house, church and fire-house. Very little new lumber is needed for these buildings.

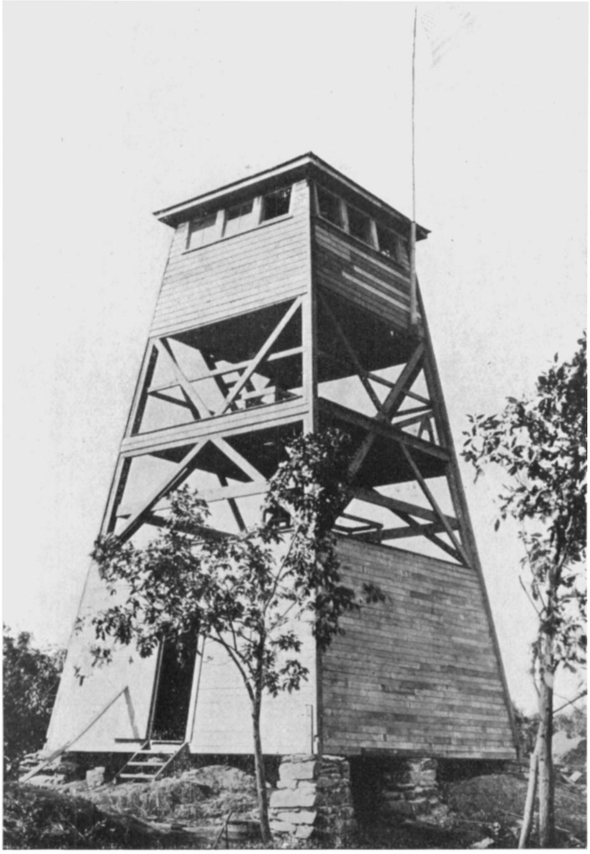

FIG. 1. OBSERVATION TOWER FOR FOREST FIRES

A few figures will prove the benefits received from this work on

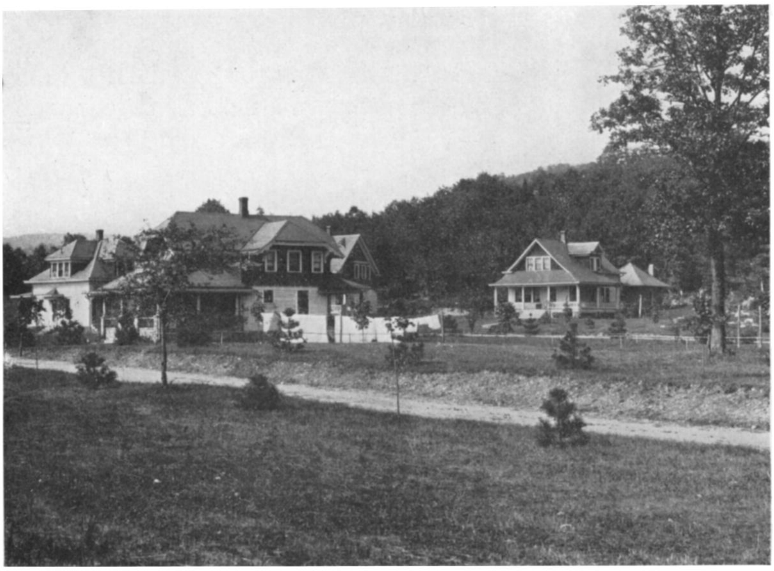

FIG. 2. VILLAGE FOR CITY EMPLOYEES BELOW THE WATERSHED

Most of the material used in building was obtained from buildings torn down in watershed.

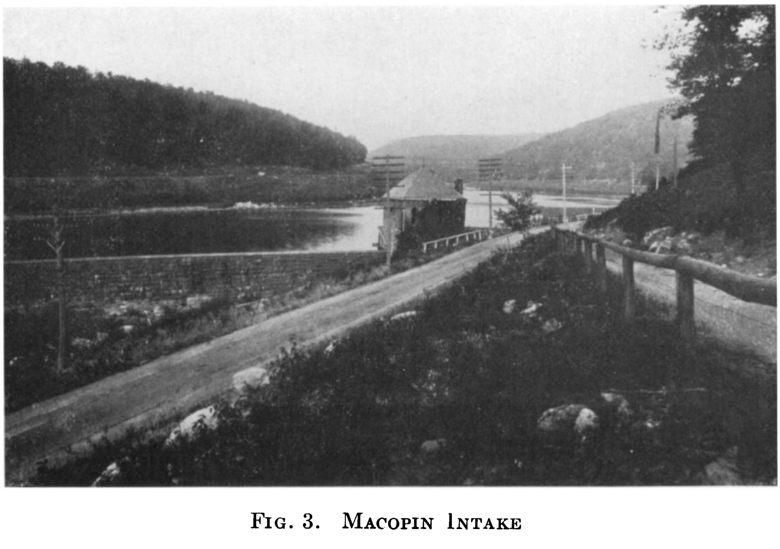

FIG. 3. MACOPIN INTAKE

the watershed. The average number of bacteria per cubic centimeter in the water at Macopin Intake dropped from 1100 in 1902 to 690 in 1910 and 511 in 1915. The decrease of the number of times that the bacteria in 0.5 cc. caused fermentation has been even greater, the figures by percentages of the total number of samples being:

	YEAR				
	1900	1908	1913	1914	1915
Bacteria	87	75	40	32	24

The number of times that the bacteria caused fermentation per 0.5 cc. of the water in the Cedar Grove Reservoir has decreased also by percentages as follows:

	YEAR								
	1906	1907	1908	1910	1911	1912	1913	1914	1915
Bacteria	67	70	50	22	36	50	17	5	5

Statistics compiled by Mr. Rosentreter show that there were 130 cases of typhoid fever per 100,000 population in 1900, when 93 per cent of the watershed was privately owned. In 1905, when 80 per cent of the watershed was privately owned, the case rate had dropped to about 80. 1910, the case rate was 52 and 56 per cent of the property was privately owned. In 1915 the case rate was 28 and 35 per cent of the property was privately owned. This rapid reduction in the typhoid fever case rate was not wholly due to the cleaning up of the watershed, however, for it was brought about in part by the improvement of the general sanitation of the city.